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NOTES ON PROCUREMENT

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These notes are written to call attention to some possibly obvious points and to offer some suggestions regarding procurement of accelerator hardware. This is intended as only a bare outline - books could be written on the subject.

The Laboratory will no doubt prepare a procurement manual in which the rules to be followed in dealing with vendors will be spelled out. This note covers considerations other than those usually included in the procurement manual. It is concerned more with the strategy of procurement.

Most of these points concern special fabrication work. Procurement of raw materials and catalog items is usually less of a problem.

Design with Procurement in Mind

The ability to buy the hardware from competent suppliers at competitive prices should be a design requirement of the accelerator. At the earliest stages, the designer should have in mind how the bid packages are to be assembled and what vendors he will go to. It is most important that the design be based on using the least expensive construction methods consistent with meeting realistic performance requirements.

Design for Commercial Tolerances

As tolerances go down, cost and procurement difficulties go up. Relaxing tolerances should be a major design objective. It is all too easy to get out of design difficulties by tightening tolerances when a more general redesign is required. Tolerances affecting performance should be set realistically

and not arbitrarily tightened to the closest the designer believes possible. Basically simple designs with a minimum of important dimensions will give the least trouble with tolerances. Whenever possible advantage should be taken of the accuracy of stock material and of the accuracy built into machine tools and inherent in usual production methods.

Don't Contract Development Work from Manufacturers.

In general, manufacturers are least expensive and most productive doing what they already know how to do. Learning how to do or make something unusual, is very expensive for them. If they have a development capability, it is probably busy on development of their own products and its effort would not be for sale. If the development required by the laboratory happens to coincide with the manufacturer's own development requirements the cost might be reasonable; but even in this case the manufacturer could easily change his plans and decide he didn't want the end result after all. In this case the laboratory would have difficulty persuading the manufacturer to keep good men on the job and to maintain any kind of schedule. The laboratory should purchase only developed products or fabrications built to laboratory drawings with the supplier responsible for material and labor only, not for performance.

Consider Dividing Important Orders Between Two or More Suppliers.

Orders can be written in such a way that the fraction of the job done by each supplier will depend on how well he is performing.

This will maintain competition throughout the work and not just for the bidding. The mere fact that each supplier knows how the other is progressing can be strong motivation to produce.

Consider "Educational" or Prototype Orders.

If time is available, production of samples of equipment built to material and workmanship requirements can be very instructive to all concerned. It should not be hoped that the samples can be exact prototypes of the production order because the construction methods for a single unit are necessarily different than for many and because of changes that inevitably appear desirable with the passage of time. The builders of the samples should not be promised more than inclusion on the list of bidders if their work is satisfactory. The value to them in addition to the sale of the sample is the opportunity to demonstrate their interest and to be able to prepare a better bid on the full order. In many cases, the samples can be used and the production quantity correspondingly reduced even though they differ somewhat from the production design.

Don't Accept Sub-Standard Products Without a Price Reduction.

Too often the laboratories are confronted with the dilemma of either accepting a sub-standard product or facing an unacceptable delay. If the supplier knows his product is required, even though it does not meet specifications, he is in a good position to hold out for full payment on the basis that if it was accepted, it must have been acceptable. This situation can result in the vendors doing a minimum job on laboratory orders and the laboratory specifications becoming no better than guidelines. Whether the laboratory can reject a sub-standard part will depend primarily on whether a delay can be accepted. Wherever possible,

on critical items more than one supplier should be used. Alternates to accepting the critical parts (which would make them non-critical) should be considered before the orders are placed. The fact should be recognized that any supplier can be late or can even fail to produce. The project procurement plan should not be like a chain which can be broken at any link. Although many sub-standard parts will have to be accepted, for the good of the laboratory's reputation with vendors at least some should be rejected.

Where departures from specifications do not make the part sub-standard and would cost the vendor much more to repair than it would cost the laboratory to change the drawings the laboratory should agree to the change. An example is where the tolerance given in a general note is exceeded but no functional difficulty can occur. Even in these cases however there should be some reluctance to change. There is a danger that the reasons why the design was made the way it was may not be recalled, the effect of the change on other parts may be overlooked and there is the cost of the designer and draftsman's time in processing the change.

Fabrication Should be Broken Down into Parts Which can be Made in One Shop.

For example; sheet metal and machine work should not be combined in one part if it can be avoided. It is sometimes wise to do a small amount of additional work of one type to avoid work in another shop. For example; a weld on a machine assembly might be replaced by a bolted joint to save moving the work to a welding shop, stress relieving, and moving back to the machine shop.

Use the Laboratory Shops On Certain Classes of Production Work.

The laboratory central shops should be able to build items that are required in single or small quantities. Such in-house work can usually be done more quickly than outside because the bidding time is not required. The shop should realize that one of the most important things it has to offer is speed and it should not become so bureaucratic that it takes as long to have the same job done inside as out.

The laboratory shops should perform the assembly work on almost all orders. Assembly work does not require expensive and specialized tools such as are often necessary for efficient parts fabrication. Also the need for modifications are more likely to appear at assembly than during parts manufacture. These can be taken in stride by the laboratory shop while changes in outside work can easily run into contract difficulties. To request bids outside and then do the work in-house is a sin which can have a traumatic effect on bidders.

Try to Have your Troubles Early.

The design of equipment should favor the reduction of assembly time at the expense of parts fabrication time and should favor reduction of installation and start-up time over both parts fabrication and assembly. This is because, as operation is approached, more investment has been made and a wider area of laboratory operations is affected. Working conditions, such as availability of tools and access to the work, get progressively worse as completion is approached. It is not surprising for the same operation, drilling a hole, for example, to cost 100 times as much at start-up as when the part is in the drill press in the shop.

The Laboratory Should Present a Reasonably United Front to Vendors.

This means that there should be consistency if not uniformity in nomenclature, dimensioning, interfacing and tolerancing and in the specification of widely used design details. Standardization must be approached gingerly in a laboratory because of its effect in discouraging change. However "recommended practices" should be established and followed unless there is good reason not to. There are many such good reasons but capricious disregard of standardization can increase costs and discourage favorable bid responses because vendors find that their experience on one order misleads them on another. The vendors always will look on the laboratory as one organization and not as a collection of independent technical groups, each with their own way of doing things.

Vendors Should Be Allowed to Use Their Own Methods.

Acceptability of products should be based as far as possible on the end product and not how it reached its final state. Exceptions to this rule do occur in which the product can contain hidden defects due to the method of manufacture. Specifying the required method in these cases must be very carefully done to be sure that the vendor is allowed all possible freedom. In any case, the price can be expected to go up if the vendor is restricted in any way in doing this work.

Avoid Aircraft and "Space Age" Suppliers.

In such manufacturing fields the quality standards and corresponding costs are far higher than necessary for usual accelerator hardware. The great majority of accelerator purchases should be made from suppliers to industry in general or to the few suppliers specializing in accelerator

equipment. The standards required by Military Specifications are expensive and generally unnecessary for accelerators.

Consider Conditional Acceptance in the Vendor's Plant.

On major pieces of equipment the vendor is in a good position to do the testing and repairs in his own plant. Also, if the equipment is taking his floor space and tying up his test facilities, he is under more than financial pressure to get it accepted. Final acceptance should be required after delivery.

To Reduce Procurement Time, Consider Buying Proposals from Prospective Vendors.

The cost of the proposals can be quite small. If this can be done before funds become available to ask for firm bids time will be saved because the vendors will become familiar with the job, fewer questions will arise during the bidding and much of the work of preparing the bids will have been done.

Cost and Time Can Be Saved by Designing Special Equipment Around Parts and Devices Already in Competitive Production.

When doing this, however, remember that the manufacturer of a catalog item is quite free to change its design provided it still meets his published specifications. Characteristics other than those specified cannot be assumed to be present on the next production lot unless special arrangements are made with the manufacturer. When designing around such items, a sample should be physically present in the drafting room before final drawings are made.